



Welcome to the PV Performance Modeling Workshop

Presenters – please let Coryne know whether we may post your presentation on our website as is or with changes.

**Note – access to today's tour will be by bus only.
We will leave from the conference center at 1 pm and return at ~3:30 to the conference center and the Courtyard Marriot.
*Any special needs, please see Coryne.***

If you signed up for the tour but are now unable to attend, please tell Coryne.



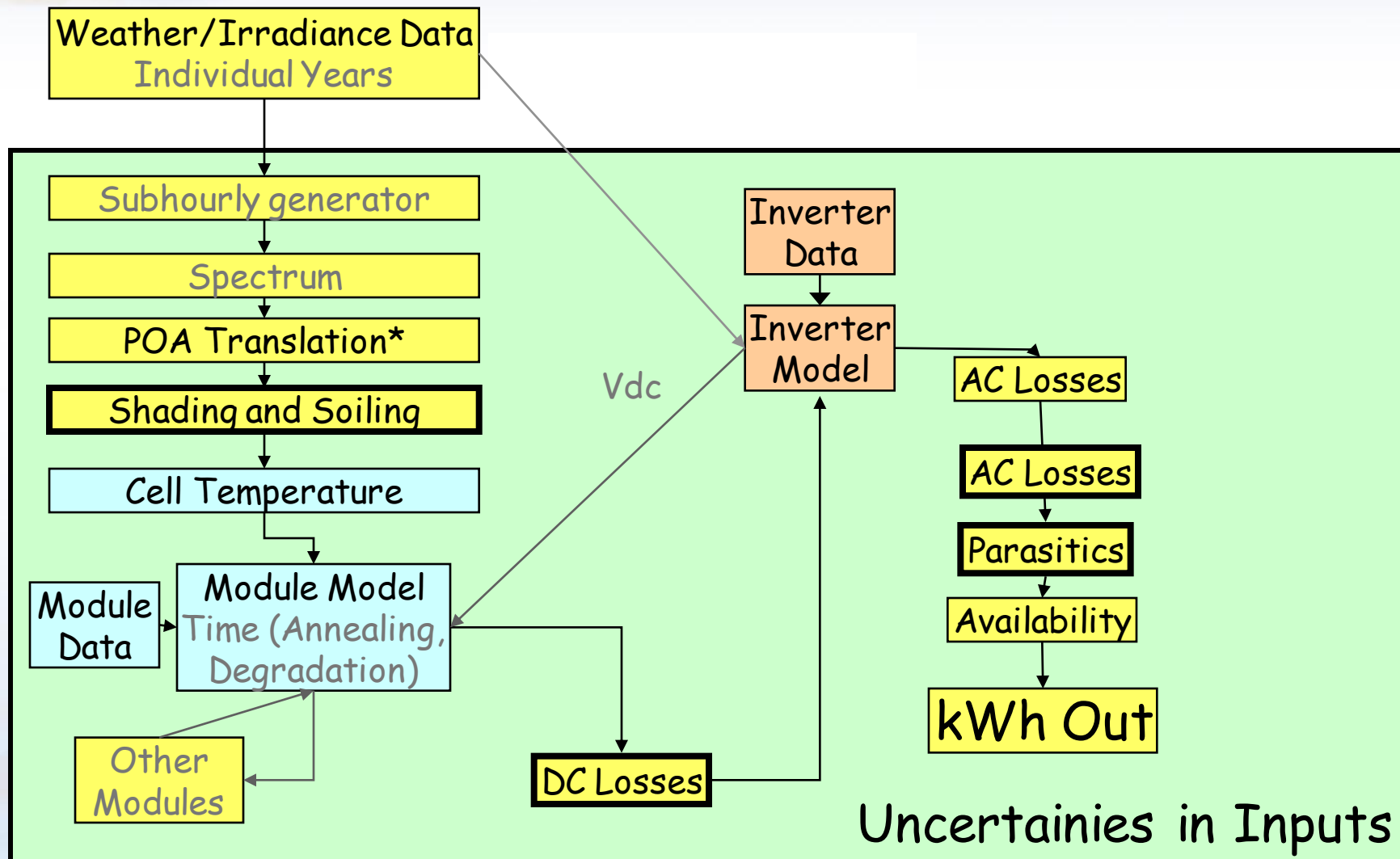
Meeting Structure

Day One

- **Overview and Needs Assessment from Integrators, Manufacturers, and Independent Engineers**
- **Analysis of Model Accuracy**
 - Results of pre-work
- **Modeling the Module**
 - Module models
 - Modeling module temperature
 - Discussion of needs, priorities, and paths forward

Day Two

- **Beyond the module – systems modeling**
 - System losses
 - Shading and MPPT
 - Large systems
 - Discussion
- **Impact of uncertainty**
- **Discussion on ensuring quality, need for standards, model validation**
- **Action items and next steps**
- **Tours**



Uncertainties in Inputs

*Gueymard has evaluated for Denver. Other evaluations for “dull” climates?

Beyond the module

Derate Factors for AC Power Rating at STC

Component Derate Factors	PVWatts Default	Range
PV module nameplate DC rating	0.95	0.80–1.05
Inverter and transformer	0.92	0.88–0.98
Mismatch	0.98	0.97–0.995
Diodes and connections	0.995	0.99–0.997
DC wiring	0.98	0.97–0.99
AC wiring	0.99	0.98–0.993
Soiling	0.95	0.30–0.995
System availability	0.98	0.00–0.995
Shading	1.00	0.00–1.00
Sun-tracking	1.00	0.95–1.00
Age	1.00	0.70–1.00
Overall DC-to-AC derate factor	0.77	0.09999–0.96001

- 11 **Develop set of test to allow industry to use, standardized test procedure, not model driven**
- 8 **Non-STC operating conditions?**
- 4 **How do modules change over time, temp coefficient, performance degradation**
- 4 **What parameters need to be analyzed with statistically-significant sample size**
- 4 **Need higher confidence factors, reports to investors, accuracy, uncertainty**
- 4 **Need data sheet standard – may help understand/reduce error**
- 4 **Identical systems in different locations**
- 3 **Stress testing – risk analysis**
- 2 **Cleaning of reference cells and sensors**
- 1 **Third party verification – standard model inputs**
- 1 **How does module model impact system model @ points other than MPP (time of use value)**
- 1 **Standardize measured data from DAS**
- 1 **Models need to keep up with new technologies**